TELOS LINK

The Telos Link introduces a state-of-the-art solution to the problem of interconnecting production intercom systems with dial-up telephone lines. Anyone with access to a telephone, even a cellular phone, can instantly and automatically be connected to your intercom. The Link has the same Telos adaptive digital hybrid technology used to improve talk shows and teleconferencing worldwide. This technology allows connections to be made without the usual gain and feedback problems while maintaining natural, full-duplex operation.

Our high-technology approach results in significantly improved communication capability. The Link was designed especially for television ENG and EFP use, but may be used anywhere it is necessary to interface two-wire intercom systems with telco lines.

A powerful digital processor is used to perform all audio processing functions including:

■ Digital auto-nulling hybrids on both the telephone and intercom audio paths.

■ Automatic Gain Control on both paths.

■ Smart gain switching to enhance hybrid performance.

■ A pitch shifter for further feedback reduction.

■ Auto Answer function for unattended operation.

■ Call signal generation.

INTERCOM-TO-TELEPHONE INTERFACE

TECHNICAL SPECIFICATIONS

System
True digital. Second generation Texas Instruments TMS320C25 processor. 8kHz sampling rate. Digital input and output gain processing, filtering.

Trans-hybrid Loss
>40dB with pink noise or voice as test input. Test set-up as specified in our Telephone Q & A.

Send Level to Phone Line
-10dBm average level. Maintained by internal digital AGC.

Frequency Response (caller to intercom)
200–3400Hz, ±1 dB.

Noise and Distortion (caller to intercom)
Distortion: <0. 5% THD+N, measured @ 1kHz at any caller level from -48dBm to -8dBm.

Signal-to-Noise
>60dB referenced to -18dBm phone level. >72 dB referenced to OdBm phone line level.

Monitor Audio Output
Three-pin male XLR connector. Active differential. Typical output level OdBm. Will drive 600Ω .

Intercom Interface
Bi-lateral current source interface for standard intercom systems. Three-pin XLR female connector. Selectable via front panel switch for channel 1, channel 2, or balanced mode operation. Intercom send and receive level variable from approximately -20dBv to -OdBv.
Channel 2/wet mode provides 18V at up to l00ma to power one or two standard belt packs.
Four-wire interface is provided via rear panel DB-15 connector. Unbalanced, 600Ω, level variable from -20dBv to -OdBv.

Physical Dimensions
7 ¼" x 1 ½" x 9 ¹⁵⁄₃₂"
18.4cm x 3.8cm x 24cm

Weight
3 pounds (8 pounds shipping weight)
1.3 kilograms (3.6 kilograms shipping weight)

Power supply
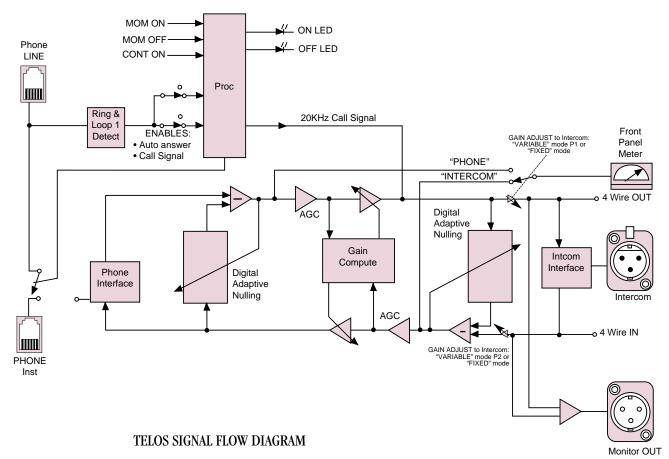External plug transformer. 9V DC, 500ma. Available for 117V/60Hz or 230V/50Hz AC.

Optional Accessories
Rack mount kits that hold one or two Telos Links in a single rack unit. Dual redundant power supply to power up to ten Telos Links.

Phone
LINE

MOM ON → ON LED
MOM OFF → OFF LED
CONT ON →

Proc

Ring &
Loop 1
Detect

ENABLES:
• Auto answer
• Call Signal

20KHz Call Signal

"PHONE"
"INTERCOM"

GAIN ADJUST to Intercom:
"VARIABLE" mode P1 or
"FIXED" mode

Front
Panel
Meter

AGC

Phone
Interface

Digital
Adaptive
Nulling

Gain
Compute

Digital
Adaptive
Nulling

Intcom
Interface

4 Wire OUT

Intercom

PHONE
Inst

AGC

GAIN ADJUST to Intercom:
"VARIABLE" mode P2 or
"FIXED" mode

4 Wire IN

Monitor OUT

TELOS SIGNAL FLOW DIAGRAM

*The processing functions are provided by software
modules running on a DSP processor rather than the
usual analog circuit sections. The digital adaptive
hybrid allows maximum gain without feedback by
adjusting to the phone line and intercom system
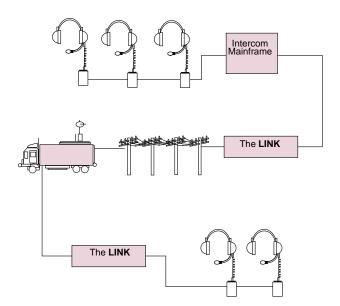impedance characteristics automatically.*

FEATURES AND BENEFITS

Although the internal technology of the LINK is complex, the installation and operation of the unit are quite simple. A number of features assist in the smooth incorporation of the interface into a typical intercom system.

■ An interface for RTS, Clear-Com, and other intercom systems is built-in. The XLR connector for intercom connection is configured in the same format as standard belt packs. Thus, the unit may be connected into your intercom system simply as if it were another station. A front panel knob selects intercom channels.

■ A "wet" single channel operation option is selectable from the front panel for applications where only one or two belt packs are required. In this mode, intended primarily for field use, the Link provides power to the belt packs and functions as a stand-alone intercom system.

■ An auto-answer function is built-in. When enabled at the studio end, auto-answer allows field personnel to call in and be connected without operator intervention. A loop current drop detector causes the unit to hang up when the call is discontinued from the other end.

■ Intelligent automatic balance nulling and gain control result in hassle-free operation. No adjustments are necessary. Perfect performance is achieved every time without "tweaking" after initial installation.

■ A function to alert listeners that a call is ringing-in is standard. This is provided via the 20kHz "call light" signalling function when available in your intercom system or by audible tone signalling

■ Monitor output is provided for connection of a powered speaker to hear the communications from the telephone line. An imperceptible, digital pitch shifter allows significant gain-before-feedback when using open speakers.

■ A digital high-pass filter is used to reduce hum and other low frequency interference. High frequency noise above the telephone frequency range is also attenuated.

■ Metering is provided for both telco and intercom levels.

■ Telephone connections are via standard modular jack and a loop-thru connection is provided for a phone set.

■ The unit is fully remotable to allow incorporation into sophisticated systems.

■ Optional rack mount kits hold one or two units in a single rack height.

The Link provides simple, reliable connection between phone lines and intercom systems.

SOME QUESTIONS ANSWERED

Why do I need a device with the level of sophistication (and expense) of the Link? Why can't I just use a transformer or something?

For reliable communication without level problems, you need to have gain in the intercom-to-telco path. Dial-up telco lines commonly have losses as high as 25dB. Also, since telephone circuits have widely varying and unpredictable transmission characteristics, AGC is highly desirable. As many experimenters have discovered, simple ad-hoc attempts usually result in frustration. This is because you need high quality hybrids on both the telco and intercom (COM) paths.

The hybrids are required in order to separate the two speech directions that appear on both the telco and COM lines. In telephone engineering terminology, a hybrid is a two-to-four wire converter because it converts the bi-directional audio on the two-wire port to two separate signals appearing on four wires. Without the hybrids, it would not be possible to insert gain or any other processing in the speech path since amplifiers are one-way devices only.

Is that why we need the digital processing?

Yes. In order to insert the desired gain without feedback problems, we must have very effective hybrids. Analog hybrids are unable to achi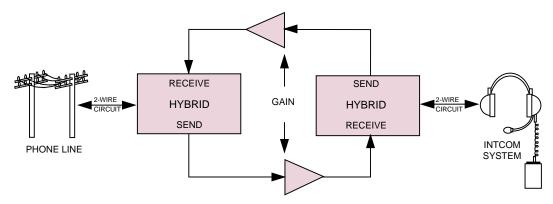eve sufficient trans-hybrid loss. That's why previous solutions were often beset by problems. The digital processor in the Link performs very accurate adaptive hybrid nulling to automatically accommodate varying telephone line and intercom system impedance characteristics. All audio functions are performed digitally, including automatic gain control, smart gain switching to enhance hybrid performance, high pass filtering to reduce hum and interference, pitch shifting for feedback reduction, and call signal generation.

So, the Link improves communications by solving feedback and level problems. What do I need to use it?

We've made it as easy as possible. Since there is a built-in intercom interface circuit, the Link may be plugged directly into the intercom buss. The phone line connects via a standard modular jack. There is a loop-through jack for connection if a desk phone or auto-dialer is used. Once installed, the Link requires no further adjustment for operation.

And the unit then appears to the intercom system as simply another station?

Yes. The Link has the same kind of "bilateral current source" circuit that is used in intercom stations.
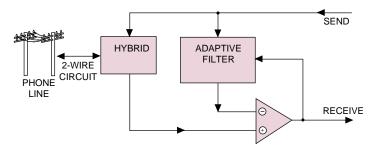

With the Link's back-to-back digital hybrids, gain and signal processing are inserted in both speech directions so that everyone hears clearly.

Does Telos make any other products for intercom to telephone interface?

The Telos ONE digital telephone hybrid has two software versions for intercom applications. One version is used to connect phone lines to four-wire intercoms providing functions similar to those the Link offers for two-wire intercoms. Another Telos ONE version is used to interconnect a two-wire intercom system to a four-wire intercom. Contact us if you would like more information for your installation.

I'm still curious. Where do I get more information about this business of hybrids and telephone lines?

Our *Telephone Q & A* has a full tutorial discussion on telephone engineering as it pertains to broadcast use as well as on hybrids and other interfacing issues. It is available from us free of charge. You may also be interested in our technical paper, *New Adaptive Digital Technology for Interfacing Production Intercom Systems to Dial-Up Telco Lines* in the 1990 NAB Proceedings.

Adaptive digital cancellation is the Telos' key to producing superior hybrid performance. The digital canceller monitors the phone line continuously in order to automatically adjust to the line impedance characteristic. A signal is created which almost perfectly subtracts any leakage of the send audio, leaving only the caller's receive audio. Another canceller provides the same function for the intercom line.

*The intercom buss is connected to the **TO INTERCOM** XLR on the Link rear panel. The **MONITOR OUT** provides a convenient way to listen to both sides of the conversation. Phone line and set connections are via standard modular jacks. The DB-9 and DB-15 connectors offer full remote and status capability and provide four-wire inputs and outputs.*